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16. Abstract <p>Chip seals provide a durable and functional pavement surface and serve as a highly economical highway maintenance option when constructed properly. Data and literature suggest that chip seal sections constructed with polymer-modified emulsions (PMEs) provide better initial and long-term performance and also extend the overall service life of pavements. This project compares the performance of chip seals constructed with PME versus those constructed with unmodified emulsion. The overall performance evaluation is based on aggregate retention performance, bleeding, rutting, and life-cycle cost analysis (LCCA). Three kinds of emulsion (CRS-2, CRS-2P, and CRS-2L) are used to fabricate samples in the laboratory and in the field. Adhesion of the emulsions is examined using the Vialit test with various curing times and temperature conditions in the laboratory. To evaluate the aggregate retention performance of the chip seals, the Vialit test, flip-over test (FOT), and the third-scale Model Mobile Loading Simulator (MMLS3) are employed. Bleeding is measured using a digital image processing method, and rut depth is measured using a profiler at three different testing temperatures (68°F, 104°F, and 129.2°F). The LCCA is estimated using the <i>RealCost</i> program, which is recommended by the FHWA.</p> <p>The results from these tests indicate that the PMEs (CRS-2P and CRS-2L) enhance chip seal performance. In terms of aggregate retention performance, the PMEs significantly improve aggregate retention in the early stages and at low temperatures. This improvement is due specifically to the fast and improved adhesion of PMEs and their ability to enhance the aggregate retention performance at low temperatures. Also, PMEs clearly advance bleeding and rutting resistance based on test results in this project. The LCCA indicates that PMEs are cost-effective if the extended life of PME pavements is two years longer than that of pavements with unmodified emulsions. The performance data obtained from this study, including aggregate loss, bleeding, and rutting, indicate that the use of PMEs can extend the service life of chip seals more than two years, thus justifying the cost effectiveness of using PMEs in chip seals.</p>			
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